



# YAKEEN <u>Cecture</u> - 7

# BODY FLUIDS AND CIRCULATION



BY 'DR. MANISH DUBEY'



# **BODY FLUIDS** AND CIRCULATION





# TODAY'S GOALS

**1** E.C.G.

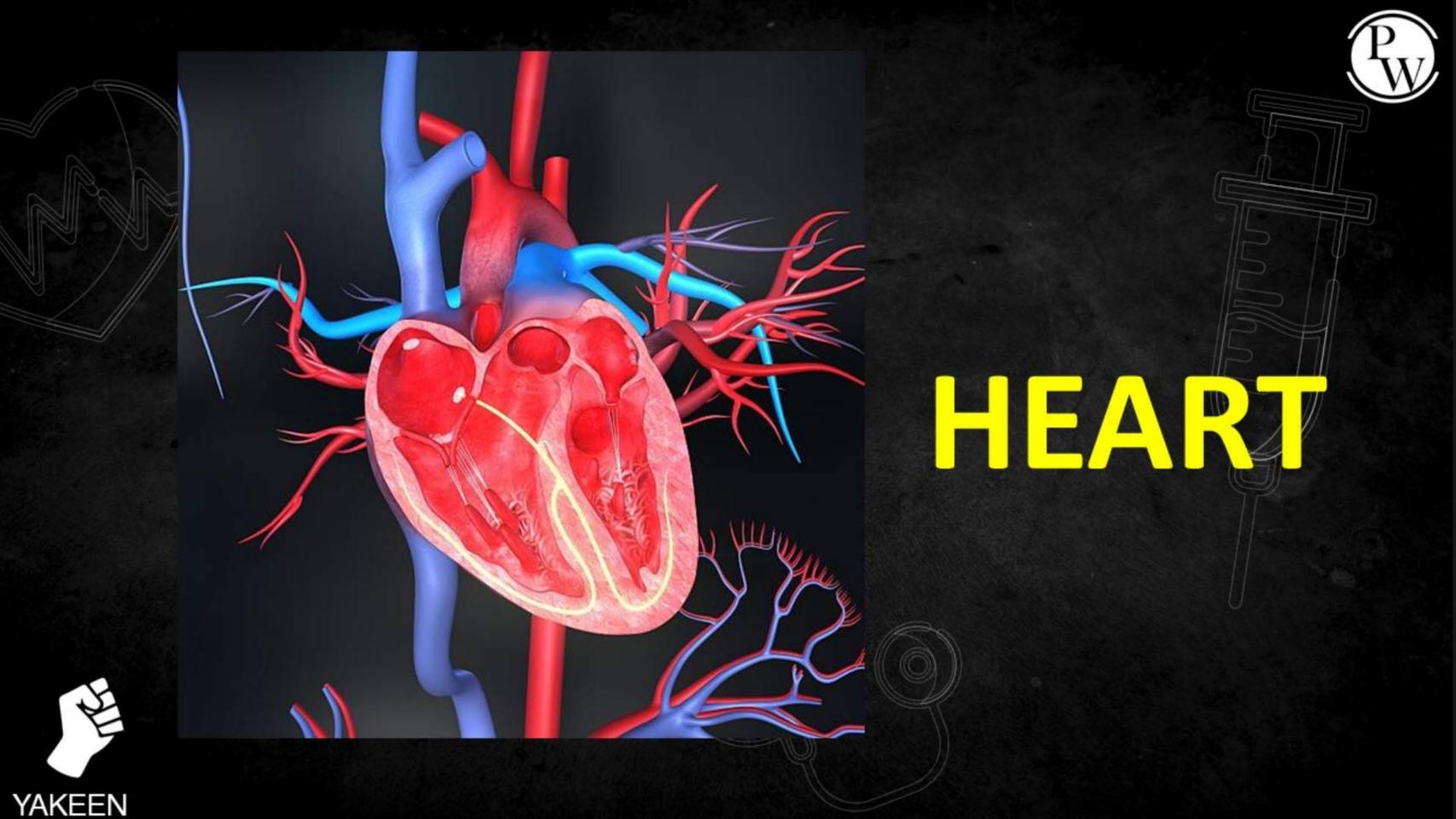


2 BLOOD PRESSURE (1)

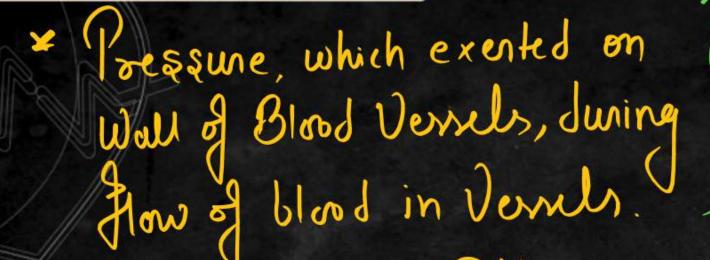
DISORDERS OF CIRCULATORY
SYSTEM

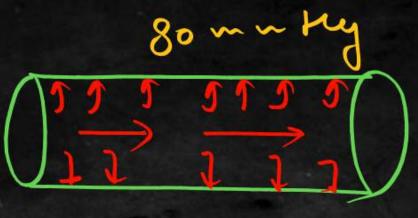






#### **BLOOD PRESSURE**

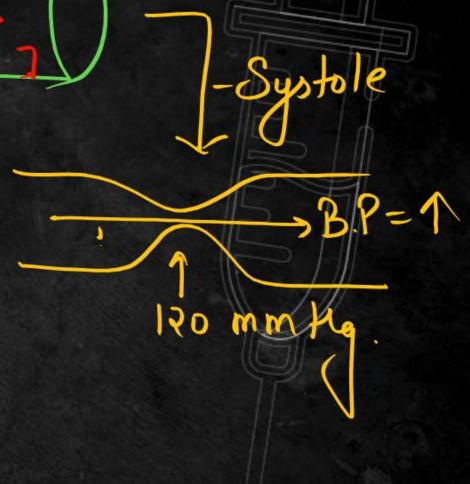






· Brastolic B.P. = 80 mm Heg

120/80





Pulse Pausune = S.B.P-D.B.P | 120-80 | 120-80 | 120 mm Hy Note- High Blood Bressure = = 140 mm ty (Hyperntennion)

1 low- Blood Bressure = = 110 "" 1. Trachy Condia = 1 - H.B.R > Brady Candia = 1-14.B.R · High B.P. in = Borta

Low B.P. in = inforior Venacava.

#### **DISORDERS OF CIRCULATORY SYSTEM**



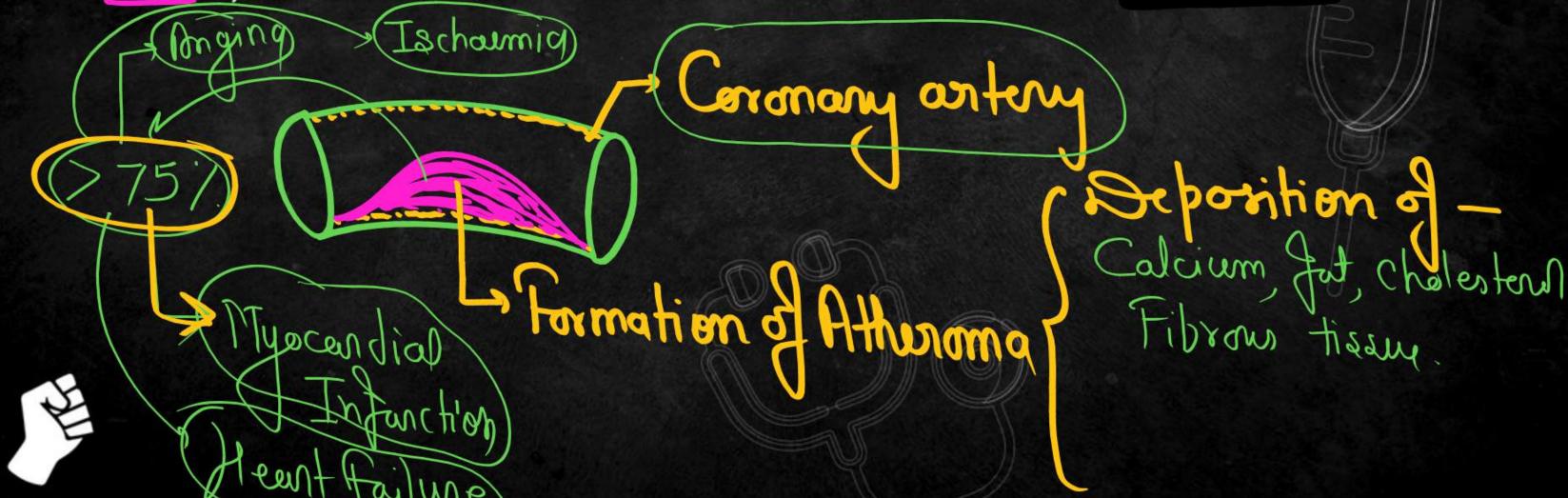
## (1) High Blood Pressure (Hypertension):

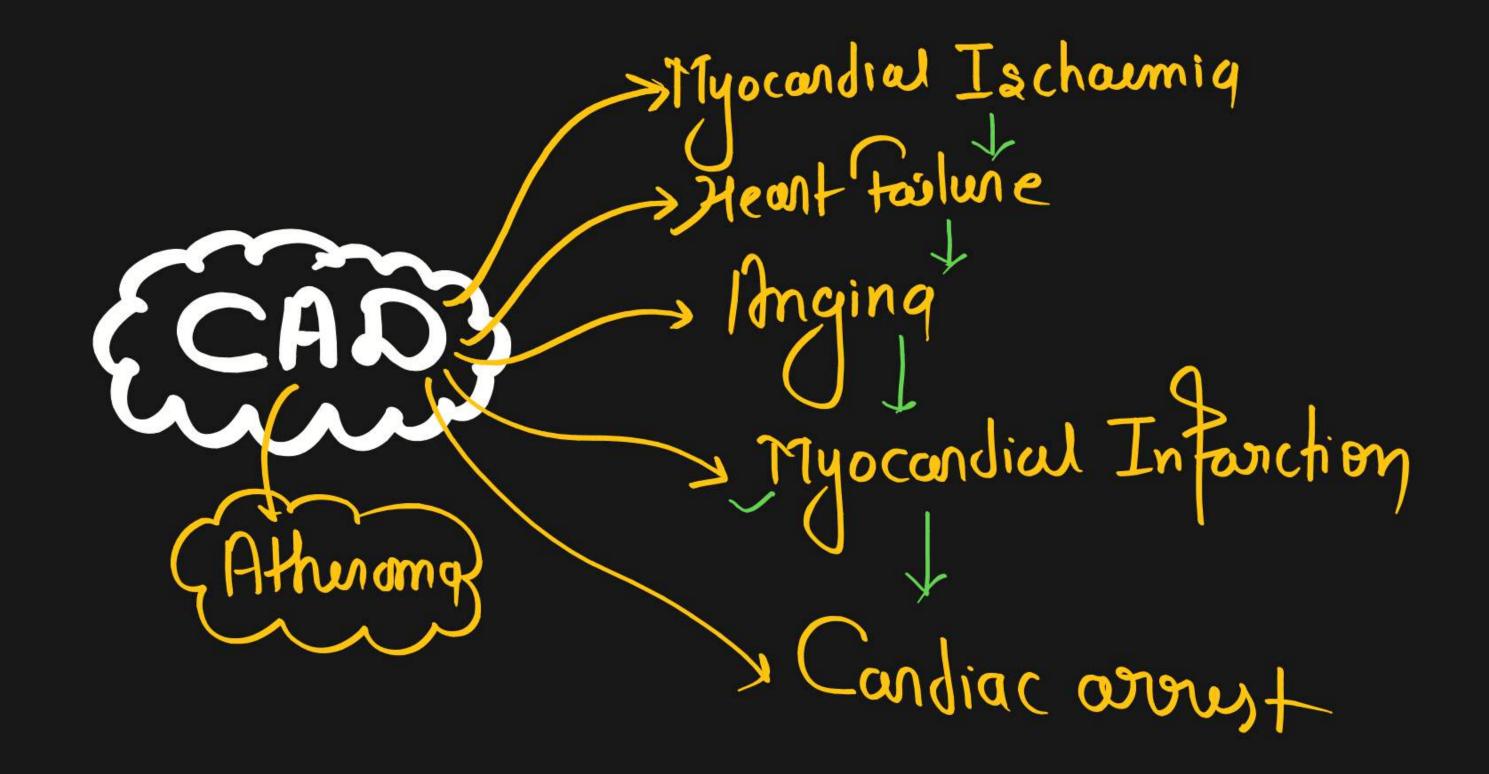
- Hypertension is the term for blood pressure that is higher than normal (120/80). If repeated checks of blood pressure of an individual is 140/90 (140 over 90) higher, it shows hypertension.
- High blood pressure leads to heart diseases and also affects vital organs like brain and kidney.





- Coronary Artery Disease, often referred to as atherosclerosis, affects the vessels that supply blood to the heart muscle.
- It is caused by deposits of calcium, fat, cholesterol and fibrous tissues, which makes the lumen of arteries narrower.







- It is also called 'angina pectoris'. A symptom of acute chest pain appears when no enough oxygen is reaching the heart muscle.
- Angina can occur in men and women of any age but it is more common among the middle-aged and elderly.
- It occurs due to conditions that affect the blood flow.



\* Myocandial Ischaumiq -> Reduced Supply of Oz to Cardiac muscles Jus to (CAD) 4 [ Lungs Conquestion?

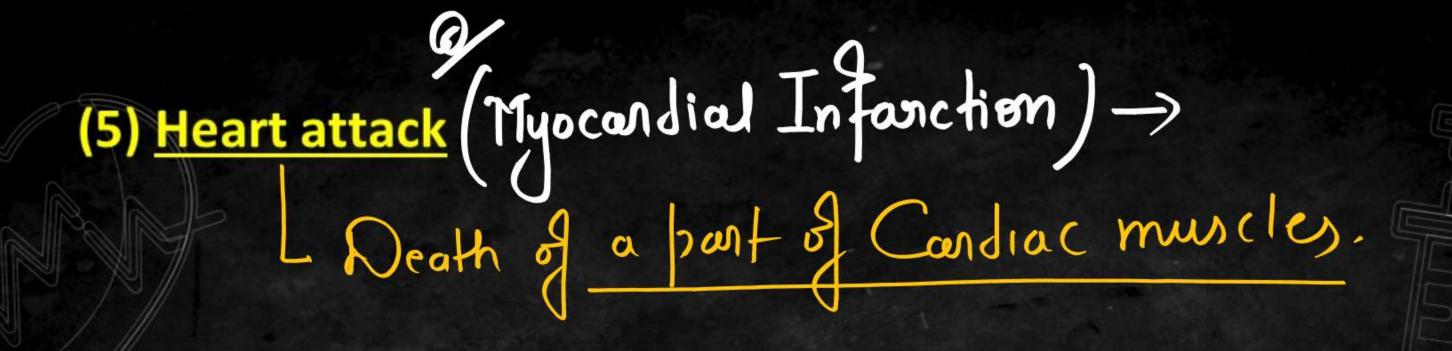


## (4) Heart Failure:

- Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body.
- It is sometimes called congestive heart failure because congestion of the lungs is one of the main symptoms of this disease.





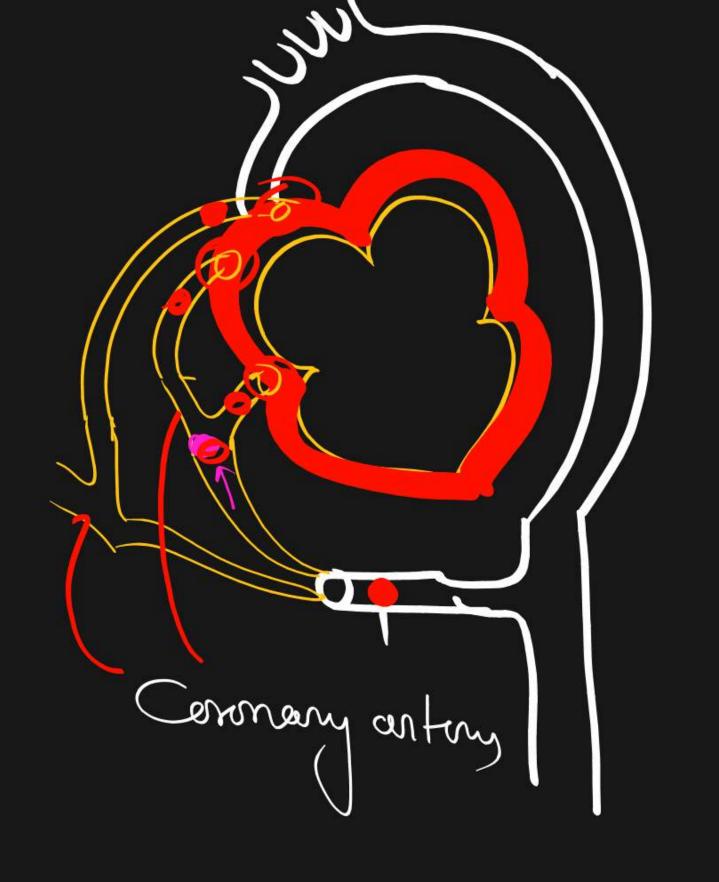


(6) Cardiac arrest

Death of Complete Condiac muscles.

Or Zero Condiac Output





Blockneye of Commeny antry

### Electrocardiograph (ECG)



 ECG is a graphical representation of the electrical activity of the heart during a cardiac cycle.

To obtain a standard ECG a patient is connected to the machine

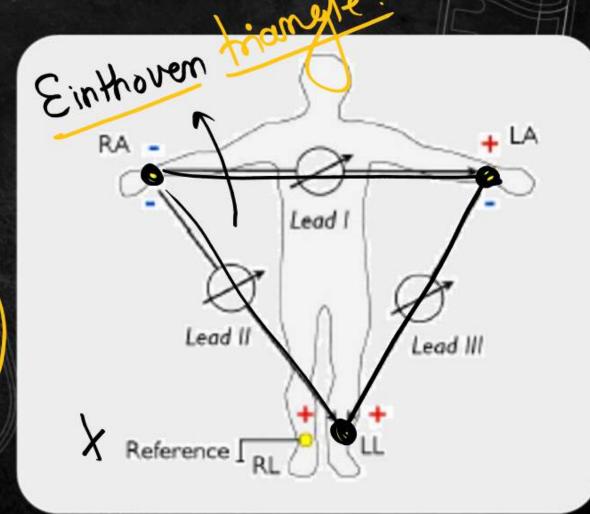
(Electrocardiograph) with three electrical

leads (one to each wrist and to the

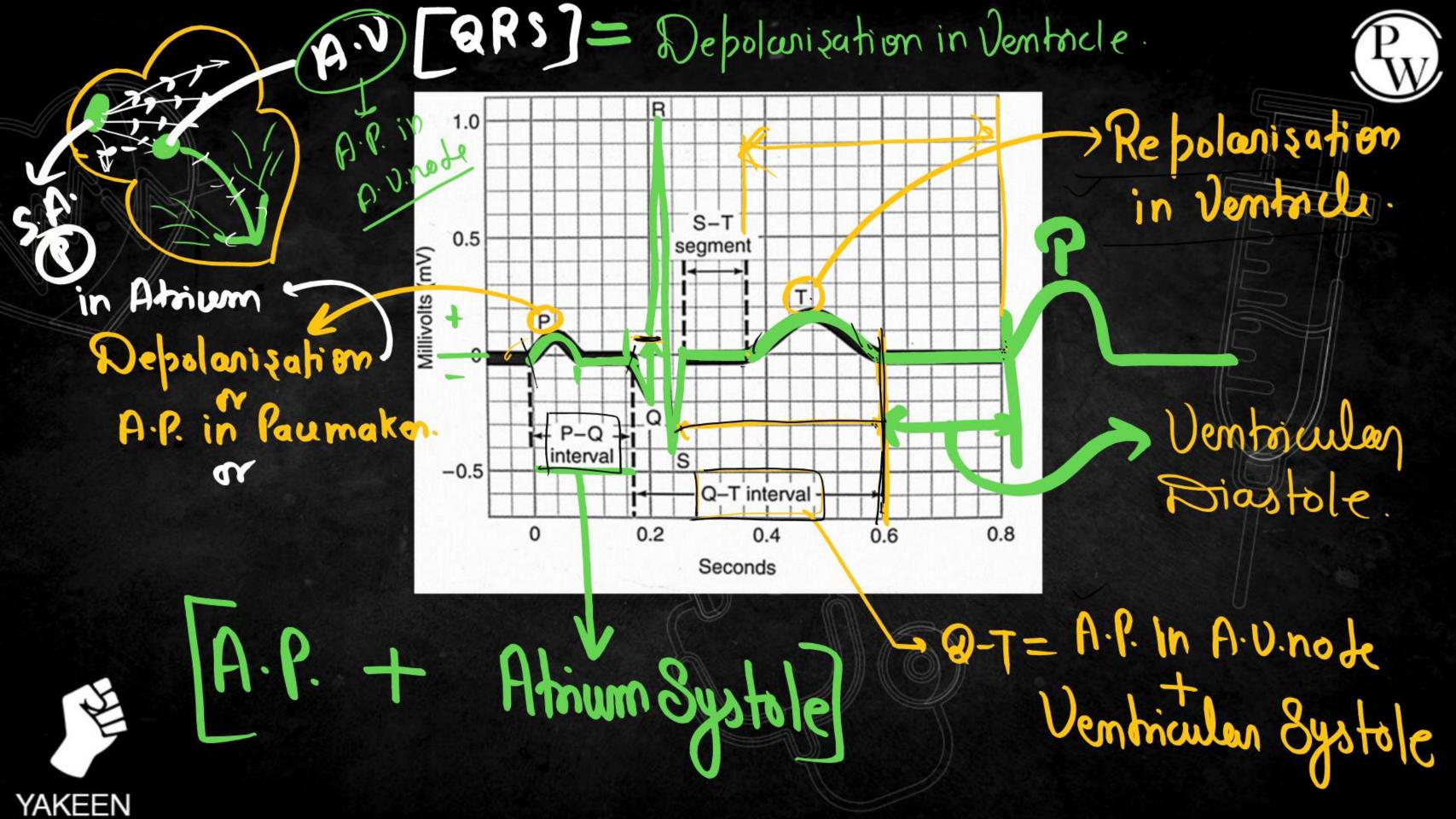
left ankle) that continuously monitor

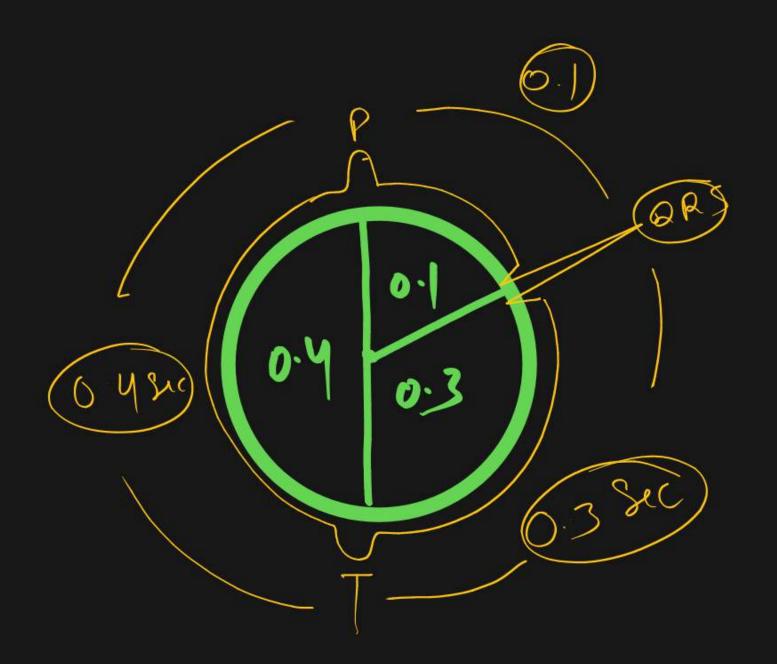
the heart activity.











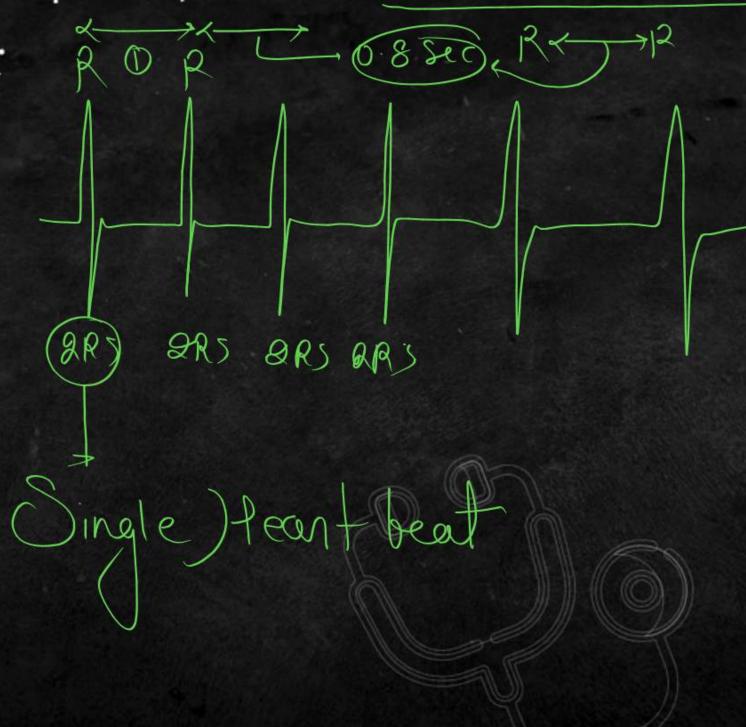
- 1. The P-wave represents the electrical excitation (or depolarisation) of the atria, (S.A.No.) which leads to the contraction of both the atria.
- 2. The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.
- 3. The T-wave represents the return of the ventricles from excited to normal state (repolarisation). The end of the T-wave marks the end of systole.

(A.V. Node





Obviously, by counting the number of QRS complexes that occur in a given time period, one can determine the heart beat rate of an individual.





- Since the ECGs obtained from different individuals have roughly the same shape for a given lead configuration, any deviation from this shape indicates a possible abnormality or disease.
- Hence, it is of a great clinical significance.

Straight lin with Sound = Pip-pip-pip-peecee

#### 18.3.2 Cardiac Cycle

How does the heart function? Let us take a look. To begin with, all the four chambers of heart are in a relaxed state, i.e., they are in joint diastole. As the tricuspid and bicuspid valves are open, blood from the pulmonary veins and vena cava flows into the left and the right ventricle respectively through the left and right atria. The semilunar valves are closed at this stage. The SAN now generates an action potential which stimulates both the atria to undergo a simultaneous contraction - the atrial systole. This increases the flow of blood into the ventricles by about 30 per cent. The action potential is conducted to the ventricular side by the AVN and AV bundle from where the bundle of His transmits it through the entire ventricular musculature. This causes the ventricular muscles to contract, (ventricular systole), the atria undergoes relaxation (diastole), coinciding with the ventricular systole. Ventricular systole increases the ventricular pressure causing the closure of tricuspid and



bicuspid valves due to attempted backflow of blood into the atria. As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery (right side) and the aorta (left side) are forced open, allowing the blood in the ventricles to flow through these vessels into the circulatory pathways. The ventricles now relax (ventricular diastole) and the ventricular pressure falls causing the closure of semilunar valves which prevents the backflow of blood into the ventricles. As the ventricular pressure declines further, the tricuspid and bicuspid valves are pushed open by the pressure in the atria exerted by the blood which was being emptied into them by the veins. The blood now once again moves freely to the ventricles. The ventricles and atria are now again in a relaxed (joint diastole) state, as earlier. Soon the SAN generates a new action potential and the events described above are repeated in that sequence and the process continues.



This sequential event in the heart which is cyclically repeated is called the cardiac cycle and it consists of systole and diastole of both the atria and ventricles. As mentioned earlier, the heart beats 72 times per minute, i.e., that many cardiac cycles are performed per minute. From this it could be deduced that the duration of a cardiac cycle is 0.8 seconds. During a cardiac cycle, each ventricle pumps out approximately 70 mL of blood which is called the stroke volume. The stroke volume multiplied by the heart rate (no. of beats per min.) gives the cardiac output. Therefore, the cardiac output can be defined as the volume of blood pumped out by each ventricle per minute and averages 5000 mL or 5 litres in a healthy individual. The body has the ability to alter the stroke volume as well as the heart rate and thereby the cardiac output. For example, the cardiac output of an athlete will be much higher than that of an ordinary man.



During each cardiac cycle two prominent sounds are produced which can be easily heard through a stethoscope. The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves. These sounds are of clinical diagnostic significance.



### 18.3.3 Electrocardiograph (ECG)





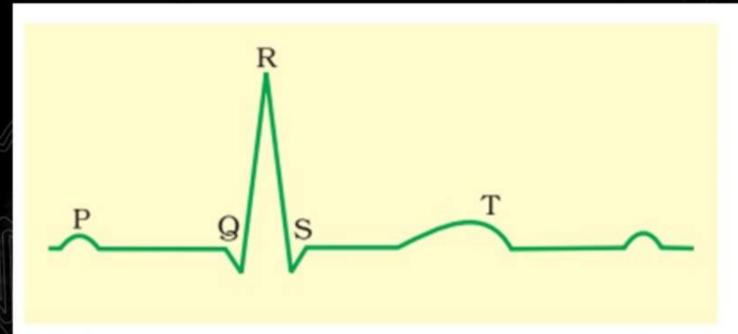


Figure 18.3 Diagrammatic presentation of a standard ECG

Figure 18.3), a patient is connected to the machine with three electrical leads (one to each wrist and to the left ankle) that continuously monitor the heart activity. For a detailed evaluation of the heart's function, multiple leads are attached to the chest region. Here, we will talk only about a standard ECG.

Each peak in the ECG is identified with a letter from P to T that corresponds to a specific electrical activity of the heart.

The P-wave represents the electrical **excitation (or depolarisation) of the atria**, which leads to the contraction of both the atria.

The QRS complex represents the **depolarisation of the ventricles**, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

The T-wave represents the return of the ventricles from excited to normal state (**repolarisation**). The end of the T-wave marks the end of systole.

Obviously, by counting the number of QRS complexes that occur in a given time period, one can determine the heart beat rate of an individual. Since the ECGs obtained from different individuals have roughly the same shape for a given lead configuration, any deviation from this shape indicates a possible abnormality or disease. Hence, it is of a great clinical significance.



#### 18.6 DISORDERS OF CIRCULATORY SYSTEM

**High Blood Pressure (Hypertension):** Hypertension is the term for blood pressure that is higher than normal (120/80). In this measurement 120 mm Hg (millimetres of mercury pressure) is the systolic, or pumping, pressure and 80 mm Hg is the diastolic, or resting, pressure. If repeated checks of blood pressure of an individual is 140/90 (140 over 90) or





higher, it shows hypertension. High blood pressure leads to heart diseases and also affects vital organs like brain and kidney.

**Coronary Artery Disease (CAD):** Coronary Artery Disease, often referred to as **atherosclerosis**, affects the vessels that supply blood to the heart muscle. It is caused by deposits of calcium, fat, cholesterol and fibrous tissues, which makes the lumen of arteries narrower.

**Angina:** It is also called 'angina pectoris'. A symptom of acute chest pain appears when no enough oxygen is reaching the heart muscle. Angina can occur in men and women of any age but it is more common among the middle-aged and elderly. It occurs due to conditions that affect the blood flow.

**Heart Failure:** Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body. It is sometimes called congestive heart failure because congestion of the lungs is one of the main symptoms of this disease. Heart failure is not the same as cardiac arrest (when the heart stops beating) or a heart attack (when the heart muscle is suddenly damaged by an inadequate blood supply).



# Previous Year Questions and Conceptual Questions

Which of the following statement is not true about blood pressure?

(1) Aigh blood pressure leads to heart diseases and also affects vital organs like brain and kidney

(2) If the blood pressure of an individual is 140/90 mm. Hg or higher it is hypertension

(3) If the blood pressure is 220/120 mm Hg it can lead to cerebrovascular acccident

Hypertension can lead to 'angina pectoris'





Pulse rate is a direct measure of

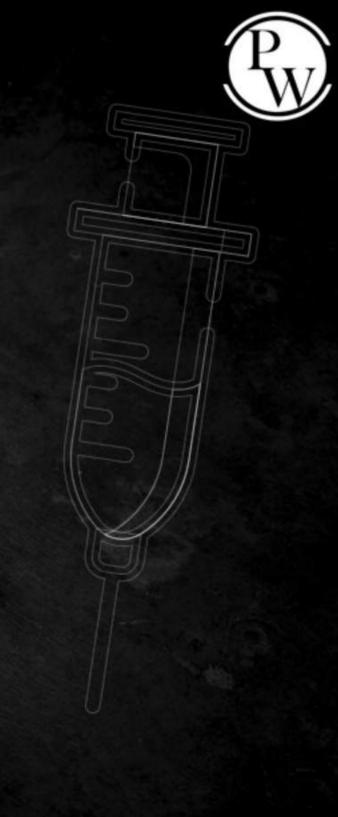
(1) Blood pressure

(2) Stroke volume

(3) Cardiac output

(4) Heart rate







The blood pressure of a person is measured as 130/75 mm Hg. His pulse pressure is

(1) 45 mm Hg

130-75

(2) 55 mm Hg

(3) 40 mm Hg

(4) 205 mm Hg







Read the following statements:

(i) Acute chest pain appears

(ii) The heart stops beating

(iii) No enough oxygen is reaching the heart muscle

(iv) Congestion of the lungs is one of the main symptoms of this disease

(v) It is more common among the middle aged and elderly

(vi) It occurs due to conditions that affect the blood

flow (CAD)

How many statements correct about Angina?

(1) Two

(2) Three

(2) Four

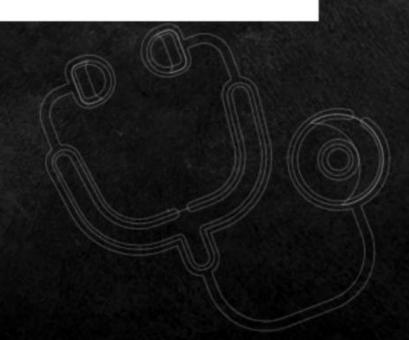
(4) Five



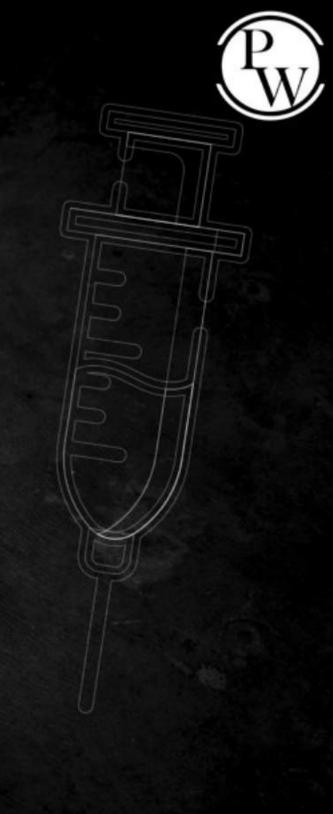


During each cardiac cycle two prominent sounds are produced which can be easily heard through a stethoscope. If during check up the heart sounds are not clear it indicates

- (1) Cardiac arrest
- (2) Heart failure
- (3) Leaky valves
- (4) Atherosclerosis



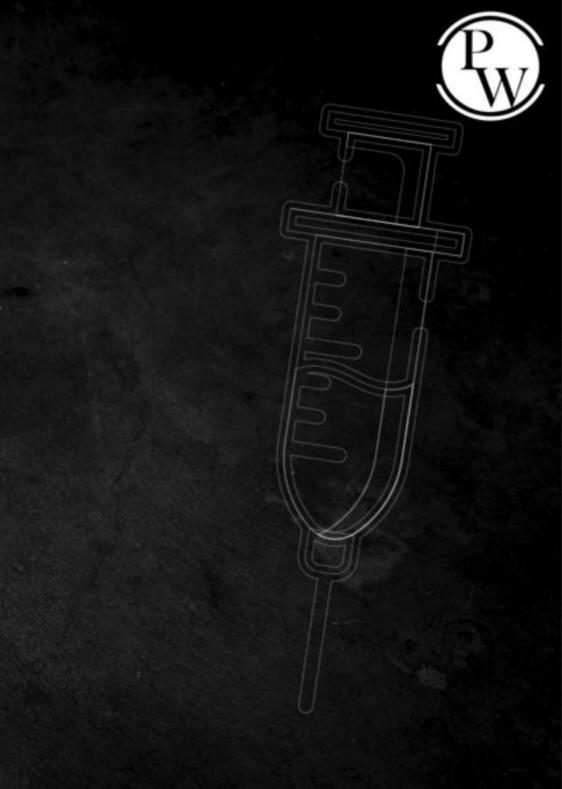




Which of the following incorrectly explains a phase/event in cardiac cycle in a standard electrocardiogram?

- P wave represents atrial depolarisation, but does not include atrial repolarisation
- (2) Q wave marks the beginning of ventricular systole
- (3) By counting the number of QRS complexes that occur in a given period of time, one can determine heart rate
- (4) ST segment represents ventricular repolarisation x





Which of the following disorders of circulatory system is **not** correctly stated?

- (1) Hypertension A sustained blood pressure of 140/90 or above

 The lumen of coronary arteries become narrower due to deposits of calcium, fat, cholesterol and fibrous tissue

- Acute chest pain appears muscle heart when by damaged suddenly inadequate blood supply
- Heart failure
- Usually called congestive failure because heart congestion of lungs is one of the main symptoms of the disease

